

Lawrence Berkeley National Laboratory Engineering Division Significant Events Report October 2001

Division Director's Comments –Jim Triplett

The events of September 11th have caused DOE Washington to ask the labs what capabilities they have that would be useful in the Homeland Security Initiative. The Engineering Division has responded to a request by the Director with a list of our relevant capabilities. We have been working on germanium and CZT radiation detectors and radiation-imaging systems in the Measurement Science and Semiconductor Detector Groups. These seem to be the most useful technologies that we could quickly provide if called upon to do so. Since the applications for these types of devices are mostly classified, we don't really know what, if anything, we will be asked to do. However, we are ready to respond if the Director calls on us.

Another result of recent events is that we are all somewhat distracted. Even though this is a normal reaction, we need to remind ourselves that being distracted can be dangerous in the work environment. In the past three weeks we have experienced a sharp increase in injury accidents. This follows a quiet period lasting through most of August and early September, during which time there were few incidents. To combat this trend and avoid injury to yourself and others, please take more time to plan your activities. Pay close attention to your surroundings and watch out for your coworkers. These difficult times require extra effort and care to keep all of us safe.

Organizational Changes

We have made a few organizational changes this summer. We have now completed integration of the old Technical Services Department with the Engineering Division by moving the matrixed mechanical technicians into the Mechanical Engineering Department. Joseph Rasson has accepted a new assignment to manage the LHC through production. I want to thank Joseph for doing a great job building and managing the Mechanical Engineering Department for the past two years. See Joseph's comments below in the Department's significant events report. Victor Karpenko has agreed to take over for Joseph as the Department Head of Mechanical Engineering. Brian Kincaid retired after only a short stay as Department Head of Engineering Sciences. I have opened a job requisition for a new Department Head. However, I have not yet decided if and when to replace Brian, so we are not actively recruiting for that position right now. This leaves the four Engineering Science Groups temporarily reporting directly to me. These groups are: Joint Genome Institute (JGI), managed by Marty Pollard; Bio-Instrumentation, managed by Jian Jin; Semiconductor Detector Group, managed by Paul Luke; and Measurement Sciences, managed by Jacques Millaud.

Project Management

For the past couple of years, the DOE has been taking a more critical view of how project management is performed on its projects. This initiative developed because of the problems experienced by NIF and other major DOE and UC led programs. U.C.'s Office of the President has responded by forming an "Oversight Committee." The response of the LBNL Director's Office is formation of a Project Integration and Management Board with members from several divisions. Even though this Board has limited authority, it is set up to watch for potential problems, make suggestions to project managers, and warn lab management of possible disasters.

Engineering Division management has been working on methods to ensure that a high level of project-management expertise is applied to our projects and the projects we participate in with other Divisions. We can also benefit from employing common practices and management tools, and sharing the knowledge we already have within the Division.

To leverage the knowledge and experience within the division, I am forming a Project Management Advisory Board. The Board members have been chosen from a list of our most experienced project managers: Bill Edwards (chair); Vic Karpenko; Peter Denes; Russ Wells; Dick Digennaro; Alan Paterson; Lowell Koht; Paul Luke; and Joseph Rasson.

The charge to the Board:

1. Provide project management oversight and advice for Engineering sponsored projects selected by and at a level determined by the Engineering Division Director.
2. Work with department heads to provide effective resource allocation for all projects involving engineering personnel.
3. Specify and provide training and development for new project managers.
4. Specify a common set of project management standards, tools, and metrics for Engineering sponsored projects.
5. Provide oversight with respect to requirements of Pub 3000 for all projects involving engineering personnel.
6. Provide the Engineering Division Director with an early-warning system for potential project management problems on all Engineering-sponsored projects and selected projects from other divisions with significant engineering involvement.

Division Retreat

The annual Engineering Division retreat was held September 19, 20, and 21. As in the past, the goal of the retreat was to get the senior managers and others from groups throughout the division together to discuss the latest issues. Short presentations were given to introduce topics; breakout groups then discussed these topics and presented their recommendations to the whole group for discussion.

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Visit http://engineering.lbl.gov/news/retreat/01_09/retreat01_09.htm to view the retreat presentations and the results of the breakout groups. The topics discussed this year are listed below.

- **Alignment with the Lab**
Our capabilities have been well aligned with the needs of general sciences and the ALS for many years. How should our capabilities change over the next five years to keep up with changes in the lab?
- **New Initiatives**
What new areas should we be investigating to build new capabilities in engineering?
- **Manufacturing Engineering**
Recently we have been discussing manufacturing engineering and the possible need for a group to be the portal to Engineering's shops and outside shops.
- **Project Management**
Over the past couple of years the DOE, UC, and LBNL have placed more emphasis on project management. What should engineering do differently to ensure that we are managing our projects consistently and effectively?
- **Communications**
There have been some improvements in communications over the past year with the new website and the Significant Events Report. What other communication tools and methods should we use?
- **Training and Career Development**
It is common knowledge that our career development and training efforts are inadequate. What should we do to improve this?

News

Superbend Milestone –Ross Schlueter

At 1:00 a.m. on Friday, August 31, the ALS storage ring held a beam of electrons for the first time with three superbend magnets in place. This milestone in ALS history occurred just hours after the superbend project entered the commissioning phase and only five minutes after the first injection attempt. An hour later, the current in the storage ring was increased to 100 mA (limited only by vacuum) at 1.5 GeV. By Friday afternoon, the energy was ramped to 1.9 GeV, and by Wednesday, September 5, the current reached 400 mA at 1.9 GeV.

Teams of accelerator physicists, engineers, and operators have been working around the clock to test and characterize performance with the superbends in action. The Accelerator Physics Group reports that, so far, the injection rate and beam orbit stability are the same as before the shutdown. Also, the dynamic properties (dynamic aperture and momentum acceptance) are similar to what they were previously, indicating that, once the vacuum

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improves, the presence of the superbends should not have a negative impact on beam lifetime.

Web Page Hits –Paul Harris

Between June 1st and September 30th, Engineering web pages were visited by 11,859 users; an average of 98 visitors per day. Read more about these statistics and upcoming web site changes in the Communications section below.

An “Enlightened” Engineering Division –Barbara Davis

EETD’s Michael Siminovitch and Erik Page, our neighbors in Building 46, are developers of a new high-performance, energy-efficient table lamp based on four years of research. To support their efforts, reduce energy consumption, and test the latest product, Engineering purchased several lamps, which were recently delivered. The lamps feature two fully dimmable and independently controlled 55-watt compact-fluorescent bulbs. Ongoing studies report energy savings ranging between 40 and 70 percent. Significant research went into the design of the lamps to deliver effective task and room lighting, while also addressing color rendition and lighting quality. For more information on the lamp’s performance, visit: <http://lighting.lbl.gov/projects/table/table.html>.



Features

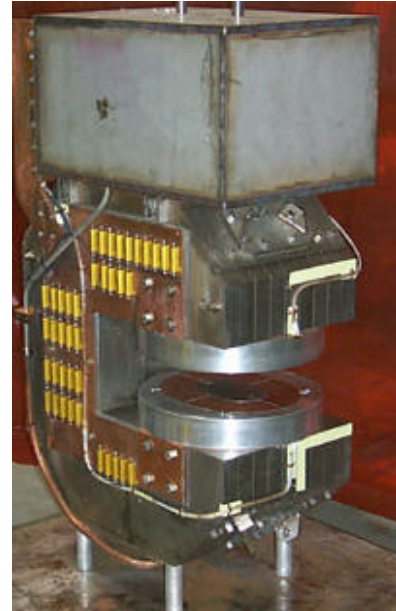
Superbend Project –Steve Marks

The three-year Superbend project is drawing to a successful conclusion. Three superconducting dipoles have been installed in the ALS storage ring, and a fourth (the spare) is undergoing final magnetic testing. The project involved replacing three of the 36 conventional 1.3-Tesla bending magnets with 5.7-Tesla superconducting magnets along with six new quadrupoles. This introduction of higher-field magnets was motivated by the demand for additional bright x-ray sources with photon energies in the 10- to 30-keV range and will allow future experimentation in the areas of protein crystallography, x-ray tomography, and powder diffraction.

The Superbend project is the first attempt to introduce superconducting magnets into the magnet lattice of a synchrotron light source. This venture faced the challenge of insuring that all magnets would work successfully; if any magnet failed or quenched, the entire ring would go down. Another significant challenge was ensuring that operation and maintenance of the ALS would not be affected by the introduction of the new magnets.

The ALS storage ring is currently being commissioned. This is a significant effort because the new magnets break the magnet-lattice symmetry and thus change the dynamics and control of the storage ring. So far, early planning, accelerator modeling, and extensive magnetic and cryogenic testing have paid off. Electrons were injected into the storage ring on Thursday, August 30; the successful results are described above in Ross Schlueter's comments. According to David Robin, "The bottom line is we are moving faster than expected, and it is remarkable where we are after just 3 days!"

The Superbend project has been a collaboration among the ALS Accelerator Physics Group, the Engineering Division, and Wang NMR (our industrial partner). Significant engineering contributions were made by the ALS Mechanical, ALS Electronics, Supercon, and ALS Controls groups. Superbend project management includes David Robin, Project Leader; Jim Krupnick, Project Manager; and Ross Schlueter, Chief Engineer.



Profiles

In Memoriam

George Wesley Turnage

George Wesley Turnage was born July 18, 1960 in San Pablo. He began his career at Lawrence Berkeley Laboratory at the age of 18 as a technician in the Engineering Division Assembly Shop, and continued until his death on August 6, 2001.

He was an avid fisherman who bragged that he always caught his limit because he had the "velvet touch." "Velvet" was well known by his colleagues for his generosity. He will be greatly missed.

He is survived by his wife of 21 years, Amber Garrison-Turnage; his 18-year-old daughter, Jennifer; his mother; a brother; and two sisters.



Craig Fong



Craig Fong lost his battle with cancer on October 18, 2001.

"I am saddened to inform you that Craig Fong died yesterday morning in the company of his wife and two daughters. I am sure that you, like me, will have moments of introspection and grief...Craig was an extraordinary human being who enriched the lives of those around him." -*Jeff Reimer, U.C. Berkeley*

Prior to joining LBNL as a project manager in 1988, Craig was working at LLNL as the lead engineer for the Fusion Test Facility.

He provided project management support to several major projects including Fusion, DARHT, and SNS. He was the program manager for the AMTEX and Forest & Paper Products projects. Craig's broad understanding of our technical capabilities, his unique multi-disciplinary background and his ability to put together teams of scientists were instrumental in identifying technology transfer opportunities.

"We have just lost a colleague and a friend. Craig Fong was an intelligent and decent man. He had courage, hope, and strength all through his difficult ordeal. His memory will stay with us." -*Joseph Rasson*

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Service Recognition –Leslie Cobb

	July	August	September
35 Yr		Roger Dwinell	
25 Yr	Ken Fowler Chuck Lawrence	Al Harcourt Alan Paterson	
20 Yr	Nancy Lewis	Gary Smith	Brad Bingham
15 Yr	Edward Domning		
10 Yr	Doug Fritz	Michael Sawada David Fraser	Patrick Casey
5 Yr	Randy Candelario Barbara Davis Rich Meyer		Earl Cornell

Retirees –Leslie Cobb

Brian Kincaid	Frederick Macdonell	Michael Morrison
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New Career Employees –Leslie Cobb



Bart Davis

W. Bart Davis recently transferred to the Industrial and Energy Partnerships Group from EETD, where he was first hired in 1990. Bart has a diverse background, with an undergraduate degree in Economics and Environmental Studies from UCSC, and two Masters degrees from Cal, one in Energy and Resources and the other in Public Policy. He is currently enrolled in the Ph.D. program in Economics, where his program has included substantial graduate coursework in Statistics. His recent academic interests include neuro-fuzzy decision making, graphical model theory, and game theory. He hopes to develop neural nets and other network methods of performing nonlinear classification and regression for several applications in NDE and Mining. Bart will also be contributing to the modeling effort for our new project with optical network manufacturers.

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 <p style="text-align: center;">Stanley Berger</p>	<p>Stanley Berger has been a professor in the Department of Mechanical Engineering at UC Berkeley since 1961. He holds many editorial positions and has authored over 100 technical publications and two books in the following research areas: viscous and boundary layer flows, low Reynolds number flows, physiological fluid mechanics, computational fluid dynamics, hypersonic flow, magneto-hydrodynamics, wake flows, and blast waves. Professor Berger will be working with us to help develop new initiatives in bioengineering.</p>
 <p style="text-align: center;">Steve Dellinges</p>	<p>Steve worked at Raychem Corporation for more than 18 years. He spent the early part of his career developing processing techniques for conductive polymers. Steve ran Raychem's Optical Draw Tower facility, developing optical fiber and cable in their Fiber Optics Group. He subsequently worked on the design and manufacturing of erbium-doped fiber amplifiers. Steve has spent several years effectively utilizing rapid prototyping methods and techniques. During the past two years, he has been designing and manufacturing Fiber Optic Network equipment.</p> <p>At LBNL, Steve will be a contributing member of DesignWorks in the Engineering Division. He will be managing the Rapid Prototyping Lab and working on design projects.</p>
 <p style="text-align: center;">Murat Kuraca</p>	<p>Murat Karaca joined the Industrial and Energy Partnerships Group as a Geotechnical Engineer. He obtained his bachelor's degree from the Technical University of Istanbul, and his Ph.D. from the Swiss Federal Institute of Technology in Lausanne. After completing a Post Doc in Berkeley, Murat worked in Japan for five years as a Research Associate at Miyazaki University. He has over 15 years of experience in geotechnical and earthquake engineering, particularly as associated with underground nuclear-waste repositories, deep and shallow underground excavations, and open-pit mines. Along with his work on the Mining project, Murat is leading our effort to develop projects in Hazard Mitigation, working with the city of Berkeley and surrounding communities.</p>

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Norman Salmon

Norman Salmon is coming to LBNL to work with the shops on modernizing software, machine tools, and work methodologies. He graduated from Western Washington University with a degree in Industrial Engineering Technology with an emphasis in vehicle design. Norman's position is strategic implementation for Design and Fabrication, but he will also be working with area shops in other divisions. Norman comes to us from New Hampshire and is owner of ONYX High-Speed Machining, a precision specialty shop and consulting firm in Amherst NH. His expertise is in high-speed machining and manufacturing.



Jonah Weber

Jonah joined the ALS Electrical Engineering Group in July. He recently completed his BSEE at Columbia University in New York. While an undergraduate, he worked for two summers as a student hire in the ALS. He's a graduate of a local high school, Oakland Tech. He'll be supporting ALS instrumentation.

Significant Events

Student/Internship Committee –Bill Edwards

Twenty-five students were hired in the division during the spring and summer; five students have decided to work indeterminate time (fewer than 20 hours per week), and three co-op students remain.

The Intern/Student Committee has produced its first annual report. The report discusses the history of the program, accomplishments of FY01, and plans for FY02. The report can be viewed online at: <http://engineering.lbl.gov/sip/documents/2001AnnualReport.pdf>.

Diversity Committee –Deb Hopkins

Human Resource's Karen Ramorino has taken the lead in helping us establish a collaborative program with Howard University in Washington D.C. that would include local high schools. Howard has an existing program that places students in companies for a 15-month internship between their junior and senior years. The model that Howard's Dean Johnson proposed would have us help recruit local high school students to attend Howard, some of whom would return to the Bay Area to perform their internship at LBNL. An important goal of the program is to provide scholarships to local students. The most promising avenue at present for funding scholarships appears to be through corporate donations. Karen has put together a list of local corporations who are potential funders; let us know if you have any connections with industry or other funding sources that might support the program.

Student/Intern Plan Development for Technicians –Bob Candelario

On September 13, Bob Candelario met with Kurt Common, the Head of the Engineering and Technology Programs at City College of San Francisco, and two of his staff: Ken Crizer of Mechanical Engineering Technology and Rich Brongel of Electronics Engineering Technology. The meeting explored the feasibility of developing a student intern program for our mechanical and electronics departments. City College has a richly diverse student body, and its Engineering Department has programs in both mechanical and electronics technology that directly relate to the work in our respective departments.

We discussed the long-term goal of having students from several advanced courses work at LBNL as part of their curriculum. This would be an extensive program and would take some time to develop. We decided to try to work out an initial plan for two to three students from each of the mechanical and electronics departments to spend 12 to 16 hours a week at LBNL during the winter semester. We plan to meet again in three to four weeks to work out the details. We also discussed having some of the graduating students join our summer program.

The meeting was very positive; it should be possible to start an initial program fairly easily and at very little cost.

Communications –Deb Hopkins, Paul Harris, Erick Herrarte

Rich Meyer, who played an integral role in publication of the Division's Breakthrough Engineering brochure, creation of web pages, and establishment of Engineering's Tech Transfer group, has moved to Building 77 where he will be working as a Technical Coordinator for Design and Fabrication. We thank him for his many contributions to communications, and wish him well in his new assignment.

Communications was one of the topics discussed at Engineering's September retreat (the overview presentation and results presented by the breakout group are available at http://engineering.lbl.gov/news/retreat/01_09/retreat01_09.htm). Creating and maintaining Engineering's web pages, publishing the Significant Events Report, and creating and disseminating promotional material are vital functions, but communications must also address development of information management tools. Communication problems identified at the retreat include:

- Critical data and information is either not archived or is not easily retrievable.
- Critical information and experience is not passed down from senior and retiring staff.
- Leverage from past experience is not realized.
- Collaboration and information sharing between projects in the division is inadequate.
- Significant time and money are lost from parallel efforts to develop data and information management tools.

As discussed below, efforts are underway to address several of these problems. These efforts include development of communication tools, and a redesign of Engineering's web pages. Your comments and questions are welcome as we work to develop communication strategies.

Communication and Collaboration Tools – Erick Herrarte

Several of the communication problems listed above can be addressed through a strategy of integrated communication tools. Requirements for such tools identified during the discussion at the retreat include:

- Tools must be easy to use and integrated; e.g., email, scheduling, and file sharing must work together.
- Cross-platform compatibility is essential; i.e., tools must work on UNIX, Windows, and Mac platforms.
- Download requirements must be minimal.
- File sharing must allow annotation of documents with notes and other metadata.

Some of these issues can be addressed with modest effort by using proven software tools that can be adopted for our particular needs. These tools include newsgroups, listservers, and work-group tools. For example, Newsgroups provide a forum for exchanging ideas

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and files. By building interfaces to the existing framework, new features can be added and functionality can be greatly increased.

Workshop on Fuzzy Logic –Erick Herrarte

U. C. Berkeley hosted the 2001 BISC International Workshop On Fuzzy Logic and the Internet. The workshop provided a forum to exchange ideas and information on ways in which fuzzy logic can be applied in the areas of knowledge organization, search, and deductive synthesis. Talks ranged from the development of fuzzy search techniques to improve search results, to defining a fuzzy document retrieval language and developing a dynamic user interface to improve search experiences. Berkeley Professor Marti Hearst discussed the development of “smarter” user interfaces to improve the users search experience; she suggested that dynamically presenting appropriate metadata that organizes search results can allow users to create smarter queries, as well as quickly browse through results. Although the workshop concentrated on search engines and information retrieval, the fuzzy logic and other techniques presented can also be applied to data analysis and data mining.

Web Pages – Paul Harris

In case you were wondering about how important our web pages are, consider the following statistics: for the four-month period between June 1st and September 30th, Engineering web pages received 265,055 hits from 11,859 users. That’s an average of 98 visitors looking at 22 pages each per day. Peak usage occurred on July 30th when the Significant Events Report was released – 450 individuals visited Engineering’s web site and viewed 29,370 pages. The sites visited most often are the July 2001 Significant Events Report (893 hits), Mechanical Engineering home page (977 hits), Engineering Division Organization Chart (923 hits), and Design and Fabrication (799 hits); by comparison, during this same period the Engineering home page was hit 5328 times. Paul Harris is tracking this data, which also includes the search phrases that directed people to our web site as well as the search engine used. “Rita Mclean” edged out “metal spinning” for the twelfth most common search phrase, and our favorite misdirected hit is the person looking for actress “Pamala” Anderson who found our Pamala Williams-Perkins instead (no relation).

A redesign is underway to improve the functionality and performance of the Engineering Division website. The current design makes some functions problematic, such as search and retrieval of database-driven information. These functions are essential for developing new features such as an A-Z index, which will be implemented in the near future. The current design also requires considerable effort to ensure that the website is compatible with the Netscape browser that is the laboratory standard, and newer versions of browsers used by much of the outside world. The new website architecture is data-base driven, allowing changes and new information to be updated automatically. For example, the StaffPlan database feeds instantly updated information (contact data, publications,

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and status of proposals) directly to the web browser. Descriptions of capabilities and projects are now database driven, allowing for a consistent structure and appearance.

The new design, while not considerably different visually, is very different functionally. In addition to the technical/administrative issues discussed above, improving ease of use of the web site is an equally compelling factor in the redesign. This will be accomplished in part by helping users to more easily distinguish between general information, and more specific data intended primarily for Engineering Division staff.

All existing pages must be converted to the new design. Your patience during this conversion is appreciated. Every effort will be made to maintain the physical address of existing pages. Please be aware that it may be necessary to change some directory or file names to accommodate the new design. This will affect your bookmarks. If changing the location of a particular page would be extremely inconvenient (for example, the web address was printed on a brochure or business card), please drop a note to engweb@lbl.gov and we will make every effort possible to leave the address unchanged.

New Initiatives –Joe Jaklevic

A presentation at the recent Engineering Division retreat outlined the FY02 initiative development plan (http://engineering.lbl.gov/news/retreat/01_09/retreat01_09.htm). In brief, the plan is to encourage division-wide participation in program development both through support of small projects targeted at emerging technologies and specific applications, and through more substantial support for larger programs in selected areas.

In pursuit of the latter goal, five subcommittees have been established in the following areas: sensors, robotics, engineered materials, software and micro/nanotechnology. As of today, these subgroups have begun to meet in order to explore opportunities within these broad fields, and evaluate them against our current or potential capabilities and our ability to develop sustainable programs. The chairs and membership of these committees were selected to provide a division-wide perspective. Resource planning for initiative development will reflect recommendations by these subcommittees.

Subcommittee	Subcommittee Chair
Robotics	Norman Salmon
Engineered Materials	Lowell Koht
Sensors	Phil Datte
Software	Erick Herrarte
MEMS/Nanotechnology	Joseph Rasson

Tech Transfer –Deb Hopkins

Hazard Mitigation –Murat Karaca

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Dr. Guna Selvaduray, Professor in Mechanical Engineering at San Jose State University and Executive Director of the Collaborative for Disaster Mitigation (CDM), visited in September. CDM, established in 1999, is a partnership of local governments, businesses, nonprofits, and academia, and is currently funded by a grant from the Federal Emergency Management Agency (FEMA). The group's mission is to work collaboratively to promote and facilitate implementation of disaster mitigation measures. Professor Selvaduray's presentation describing CDM and ongoing projects was followed by a discussion of opportunities for collaboration between Engineering and CDM. A follow-up visit to San Jose is planned for the near future.

Professor Selvaduray's visit to Engineering followed an August CDM meeting in Santa Clara's Office of Emergency Services, during which Murat Karaca made a presentation on the 1999 Turkish Earthquakes. Murat also translated a brochure titled "Helping Children Cope after a Major Earthquake" into Turkish. CDM had previously translated the brochure, published by the Center for Living and Dying, into Chinese, Korean, Spanish, Russian, and Vietnamese, in recognition of the cultural and ethnic diversity of Santa Clara and San Mateo Counties. Copies of the brochure are available at: <http://www.sjsu.edu/cdm/projects/>.

Chevron Technical Exchange –Don Foster

The first of a series of Technical Exchanges with industry was held at LBNL on July 30, 2001. The four guests, from Chevron Research and Technology Company, were Ignatius Chan, Team Leader, Material Characterization Team; Don Young, Staff Scientist, Integrated Laboratory Technologies; Mike Riddle, Strategic Research Coordinator; and Chia-Pin (CP) Hsiao, Sr. Engineer, Non-Destructive Evaluation Engineering Mechanics. An afternoon agenda included speakers from three divisions primarily addressing Sensors and Measurement Systems. Murat Karaca of the Engineering Division presented a talk entitled "Feasibility of Using Fiber-Optic Sensors for Detecting Hydrocarbons." Murat's talk addressed some of the NDE work being done in Deb Hopkins' project with the auto industry as well as a recent literature search on fiber-optic sensors. Combining laser ablation and laser ultrasonics with fiber optics might be an opportunity for an exploratory technology program.

Bioscience Partnerships –Joe Jaklevic

A number of emerging opportunities for bioscience partnerships show great potential for funding although there has been no firm commitment of resources. Work continues at the ALS on automation of protein crystallography; the hardware is up and working, Earl Cornell and Arthur Jones remain deeply involved in the control and data acquisition software, working closely with Carl Cork.

Initiatives in mass spectrometry, protein purification, and combinatorial chemistry are all in the works. In addition, the division appears to have been successful in the LDRD arena with probable awards to Henry Benner for lipoprotein analysis, (with Ron Krauss of Life Sciences), and Tony Hansen for microparticle DNA injection into cells.

Lathrop Engineering Visit to LBNL – Tony Hansen

Phil Davis and Bruce Davidson of Lathrop Engineering made an informal presentation about their company's activities on October 3. Lathrop specializes in taking clients' research prototypes and designing them into manufacturable products. The 25 engineers employed by Lathrop have considerable experience with component selection, integration of subassemblies for manufacturing and serviceability, end-effector design, packaging, consumer-friendly software, and cost control, with considerable emphasis on 3D CAD tools for design and visualization.

The presentation exhibited a number of biotechnology applications that are similar to LBNL's Bio-Instrumentation effort. Lathrop's designs utilize motion control, sensing, dispensing and pipetting, and laser optics.

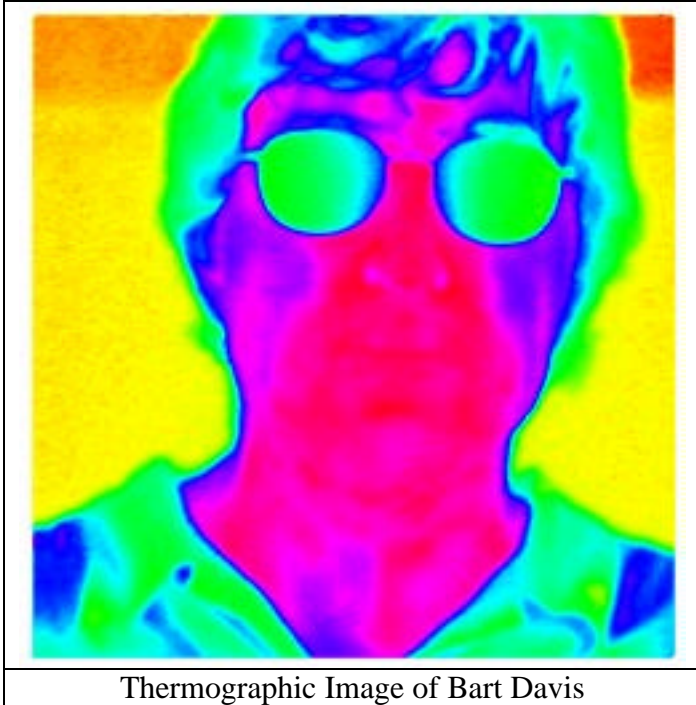
LBNL Engineering Division's collaboration with Lathrop could produce small numbers of "finished-product" prototypes in a short amount of time. Lathrop could also be a resource for estimating costs and manufacturability for technologies under consideration.

Industry & Energy Partnerships –Deb Hopkins

Thermal Lie Detector – Daniel Türlér, Bart Davis

Researchers in Engineering and EETD have more than a decade of experience in the development of post-processing algorithms that can be applied to dynamic or steady-state thermal signatures to enhance features in thermal images. For example, pulsed-phased thermography is used to detect flaws at depth in materials. Fourier and filtering techniques are applied to steady-state images to enhance underlying structures such as blood vessels or the sympathetic nerve system; this technique is now used for early detection of breast cancer. Similar methods could be used to more effectively detect changes in blood flow. A proposal was recently written in response to a call from DOE's Special Technologies Program to develop, apply, and evaluate facial thermal imaging for the detection of deception during interrogation. The goal is to demonstrate a system that can be deployed in the field to capture spatial and dynamic variations in facial temperature as a physiological indicator of stress, to substitute for or complement other deception detection techniques.

With a liquid-nitrogen super-cooled CCD, the IR camera used in the thermography lab is sensitive enough to discern 100 distinct temperature levels on a typical human face.



Thermographic Image of Bart Davis

Improved lens technology has recently enabled spatial resolution of 20 μm , sufficient to observe heat and blood flow in different areas of the face, visible as small local differences in temperature. Research has demonstrated that respiration rate can also be observed in thermal images as local cooling and heating around the nostrils. Galvanic skin response (sweating) is the most important physiological parameter monitored in conventional polygraph exams that still eludes remote detection. IR thermography should allow measurement of facial variables with sufficient resolution to characterize galvanic skin

response, and thereby has the potential to be a substitute for traditional intrusive polygraph techniques. Thermography could also be used to complement traditional polygraph measurements with the goal of reducing the rate of false positives and false negatives.

Vehicle Retrofit – Daniel Türler

Working in collaboration with the Ford Motor Co. and NREL, the roof of a Lincoln Navigator was retrofitted with EETD's patented gas-filled-panel insulation. The project was completed under extremely tight time constraints, to fit into previously scheduled side-by-side experiments at NREL to test thermal management technologies. EETD's Howdy Goudey and Engineering's Mehdi Malek-Ahmadi traveled to Denver to inspect the vehicles and make templates required to fabricate the insulation. One of the vehicles was disassembled to the point where the headliner could be removed so that the structure underneath could be inspected. The roof structure was well suited to insulation, having an air gap up to one-inch thick and large unobstructed areas. After their return to Berkeley, Howdy and Mehdi fabricated the insulation panels in less than a week. There was not enough time to ship materials, so the gas-filled panels, installation equipment, and an IR camera were taken to Denver as checked luggage. The panels were quickly installed, but testing was delayed because Mother Nature didn't cooperate; the hot summer weather expected didn't materialize for several days. At the end of the test week, temperatures were sufficient to allow collection of useful data, which included thermocouple measurements and IR images.

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The pictures below show the insulation installed in the roof, the vehicles during testing, and thermal images taken in and outside the test vehicle. The thermograms revealed interesting details that can be used to improve the insulation design, but quantitative data analyses will not be possible because the interior temperatures were disturbed significantly when the camera was placed inside the vehicle. A simple calculation model will be used to analyze the data, and to make comparisons between the modified and unmodified cars. It is expected that the headliner insulation will slow heat buildup inside a vehicle parked in the sun. Improved passenger comfort while driving, increased fuel economy, and a possible reduction in noise are potential welcome side effects of using gas-filled panels under the roof. A complete project report will be available later this year.



Insulated Double-Pane Windows for Cars –Daniel Türlér

The Industrial and Energy Partnerships Group was recently approached by an automotive supplier to help develop electrically heated double-pane window units for automotive applications. An earlier collaborative study demonstrated that significant improvements in fuel economy can be realized by insulating the passenger compartment insulation substantially reduces peak heating and cooling loads, thereby allowing HVAC equipment to be downsized. Downsized air conditioning and heating units are also important for cars using alternative propulsion technologies such as electric and hybrid vehicles. Cars have substantial glass areas; thermal losses are best addressed with double-pane windows. But the insulating window units also pose new technical challenges. For example, under winter driving conditions, visibility in conventional vehicles is maintained by blowing warm air on the windshield and side windows. The new double-pane glazing units are so insulating that the heat reaching the exterior pane is insufficient to thaw snow and ice. The objective of the new project will be to incorporate a transparent conductive layer on the inside of the outer pane, which will be used as an electric heater to thaw snow and ice during winter. The conductive layer will also incorporate a low-emissivity coating to reduce thermal losses, and a reflective coating to reject solar heat gain in the summer. Experiments will be conducted in EETD's infrared thermography laboratory to verify the effectiveness of the heater.

France Berkeley Workshop –Deb Hopkins

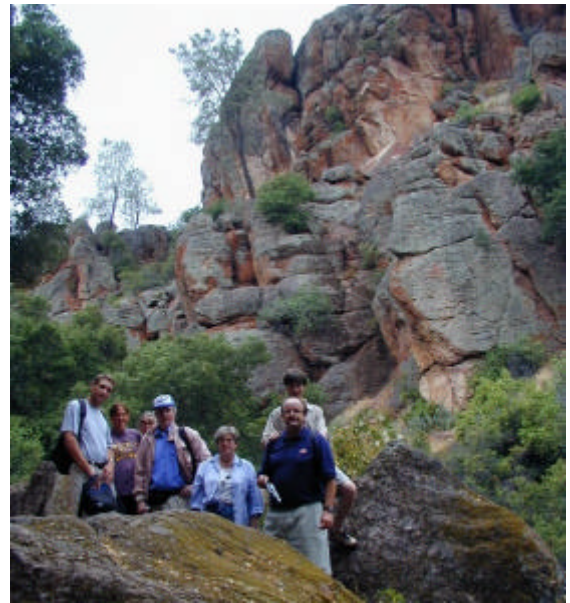
With funding provided by the France Berkeley Fund, Engineering Division hosted an international workshop on Micromechanics of Natural Rock Fractures Under Shear Stress. The July workshop participants included researchers and graduate students from France, Switzerland, England, Canada, and Berkeley. The purpose of the workshop was to bring together experts in the field to determine research needs to better understand the mechanical behavior of fractures and fractured rock masses, discuss research underway, determine opportunities for collaborative work, and review the work of participating students. Understanding the micromechanical behavior of natural rock fractures subjected to shear stress is of fundamental importance to a number of problems in geotechnical engineering including preventing failure in tunnels and mines, understanding earthquake fault mechanics, improving geothermal and petroleum production, and facilitating environmental remediation in fractured rock. The research stands to make significant contributions to other fields as well. For example, in Materials Science, understanding the micromechanics of interfaces under shear stress is fundamental to understanding friction and wear. Following the workshop, Antoine Marache of the University of Bordeaux and Deb Hopkins traveled to Washington D.C. where they presented results representing many of the workshop participants at the 38th U.S. Rock Mechanics and Rock Engineering Symposium.

The pictures below were taken on field trips to the San Andreas fault zone, Pinnacles National Monument, and coastal areas where interesting rock outcrops could be explored.

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France Berkeley Workshop



Nondestructive Evaluation (NDE) –Fred Reverdy

The automotive industry's steering committee for the NDE project asked LBNL to evaluate commercially available spot-weld inspection systems, and analyze results of a round-robin series of experiments. LBNL was also asked to evaluate the potential of phased-array technologies under development for inspecting welds. As part of that effort, Fred Reverdy and Deb Hopkins attended the annual Quantitative Nondestructive Evaluation (QNDE) conference in Brunswick, Maine, and traveled through several eastern states following the meeting to visit commercial vendors with the most promising technologies. Initial findings were presented to the steering committee in Detroit. A report summarizing the results of round-robin testing will be prepared and presented in Detroit in December. Long-term issues include development of inspection techniques for spot welds in aluminum and high-strength steel.

Mining –Murat Karaca

Determining mineralogy prior to moving blasted rock in an open-pit mine is important for routing the material to the appropriate processing stream and minimizing the amount of dilution that occurs in blasting. A measurement system is under development to map the mineral content of the borehole while drilling, with the long-term objective of using the data to create a detailed three-dimensional mineralogical map that can be used to improve downstream process efficiency. The mineral-content sensor being used is based on x-ray-fluorescence (XRF) spectroscopy. Bob Giauque has analyzed more than 200 rock samples from the Phelps Dodge Morenci Mine. A prototype system that allows continuous sampling of dust/cuttings on the drill rig during drilling has been built and tested at the mine. The samples collected have been analyzed using the XRF technique, and the data are being used to produce borehole maps of mineral content. Statistical techniques are being used to analyze the mineral-content data to determine if it can be used to identify rock types. If the XRF data can also be analyzed to provide information about rock properties, it can be used in conjunction with drilling and geophysical data to optimize blasting parameters.

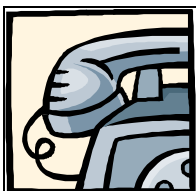
DesignWorks –Ken Chow

Accomplishments

- DesignWorks has moved (again)! Home is now the site of the former glass shop in Building 77. Many people contributed to cleaning the space, removing stored items, and working on electrical and networking installations. After the facility was painted, the team moved in at the beginning of September. We still have some unpacking and lots of small details to attend to, but the DesignWorks staff is in full operation.
- Two new core staff members are Steve Dellinges (see New Hires) and Lisa Gullo, who both joined DesignWorks in mid August. Lisa and Steve have already contributed significantly to setting up DesignWorks in its new home.
- The group's first rapid prototyping machine, a Stratasys Fused Deposition Modeler (FDM), is set up, and parts are already being produced. The FDM makes a hot extrusion of ABS plastic and builds up slice layers to make a complete plastic model. This machine will be used for user-interaction, functional, interface, access, and process prototyping. The 3-D models it can produce are excellent for visual communication of design concepts. The maximum model size is 8 x 8 x 10 inches. Larger models can be built up by gluing together smaller parts.



Technical Integration Group –Jim O'Neill



The Technical Integration Group has a new central phone number: 486-2525.

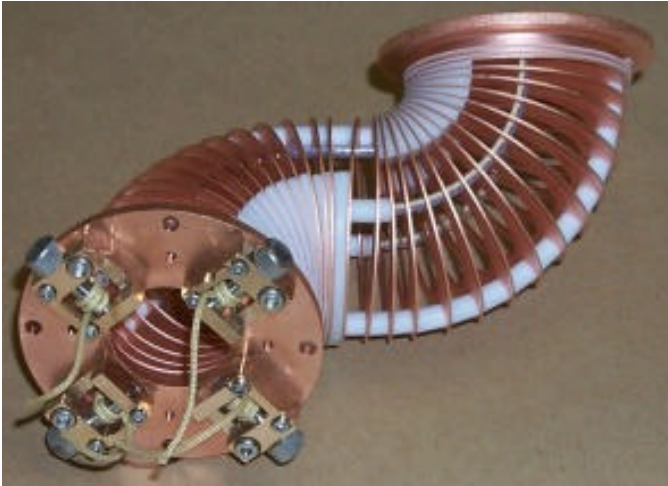
The goals and mission of the Technical Integration Group were presented at Engineering's September retreat; a copy of the presentation is posted at http://engineering.lbl.gov/news/retreat/01_09/retreat01_09.htm.

The machine floor in Building 25 is going through some changes for the better. Both Herco CNC machines have been moved to the main machine floor. The rooms they occupied are being painted and converted to an inspection area and a grinding room. We've purchased a small Brown and Sharp CMM, and should have the inspection facility up and running by the end of the month. As the main floor gets a little better organized for work, we hope to acquire some new machines to upgrade our capability and improve efficiency. We took a trip to LA last month and looked at what DECKEL MAHO has to offer. There are two machines that look like good candidates for prototype R&D work. One is a three-axis universal tool-change mill (Model DMU50T) with two additional manual axes. The other machine that looks interesting is a manual CNC lathe (Model NEF 520). Check these machines out at <http://www.gildemeister.com/>.

On the project level, we are heavily involved in the monochromater upgrade for ALS. Fabrication of parts is complete; alignment and installation of components are in progress. We had several other customers trying to get year-end work accomplished so we've been very busy. Pictured below (upper left) is a prototype plasma filter that was designed and built in Building 25. The plasma filter has double-offset bends, and was used in an experiment to develop a diamond-coating process. The lower-right picture shows the assembly with the plasma filter in its vacuum vessel. The lower-left image is a Gas Electron Multiplier (GEM) detector grid in its stretching fixture being inspected in the Building 25 vision-measuring machine. The picture in the upper right is a double-helix bending fixture for the ALS monochromater cooling tubes. This fixture was machined on a CNC in Building 25, where prototype-cooling tubes were also fabricated.

On the organizational level, I want to assure everyone that our primary focus is our customers and accomplishing their goals. With that said, we have initiated a new posting for a Senior Mechanical Engineering Associate. We are in a building phase, and hope to add additional staff as we become more involved in new LBNL projects and initiatives.

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Work underway in the Technical Integration Group (see descriptions above).

Semiconductor Detector Group –Paul Luke

- Our investigation of CZT crystals for gamma-ray detector applications has resulted in the first clear evidence that inclusion of Te in the crystals is correlated to charge transport non-uniformity. This is a major step toward development of high-resolution, room-temperature gamma-ray detectors. Much of the work is being done by Mark Amman and Julie Lee.
- The LBNL CCD developed by Steve Holland and Nick Palaio was featured in four articles in the latest newsletter published by the National Optical Astronomy Observatory (<http://www.noao.edu/>). They also provided the cover picture. The newsletter can be found at <http://www.noao.edu/noao/noaonews/sep01/pdf/>. Two of the articles describe science results with the CCDs, and one describes a new instrument using the CCDs.

Joint Genome Institute –Marty Pollard

From July to September, the production sequencing process at the JGI was completely revamped. The JGI is one of the first labs in the world to use rolling circle amplification (RCA) as a full-scale production process. Along with the new process, a new complement of robotic sample processing platforms have been



installed. Since the beginning of the summer we have purchased, installed, programmed, and tested one new Genetix Q-Pix colony picker (to go along with the two existing Q-Pixs), two new Beckman Biomek FX pipetting robots (plus an additional existing Biomek FX) and three Matrix Platemate pipetting robots. We purchased two Robbins Hydras (384 Duraflex syringe needles) integrated with Zymark Twister robot arms. One system is already here; another is being delivered. This adds up to about \$1 million in new equipment. We have fabricated and installed six custom LBNL high-field magnets for use in the Biomek robots. We have also written a custom Visual Basic software package to operate the Robbins



Hydra/Twister system. A custom liquid dispensing system is being developed. LBNL Instrumentation staff are also involved in working on much of the production sample tracking software and developing a web-based work request system. All of these changes have led to the retirement of a great deal of equipment, including five CRS robot platforms, LBNL's custom PrepTrack systems, 15 HiGro incubators, 20 Robbins (96-channel) Hydras, about 20 Eppendorf centrifuges, two Flexys colony pickers, and many smaller pieces of equipment. The result of all this work includes a simplified process,

reduced production staff, reduced space needs, higher sequencing read lengths, and higher sample yields.

The JGI has also initiated a new program in Functional Genomics to investigate gene regulation in the model organism *Ciona Intestinalis*. The JGI's expertise in large-scale biology is very appropriate for Functional Genomics. The Instrumentation Group is currently working on designs for equipment to scale up DNA preps and in-vitro fertilization processes. For more information, visit the website at: <http://www.jgi.doe.gov/programs/ciona.htm>.

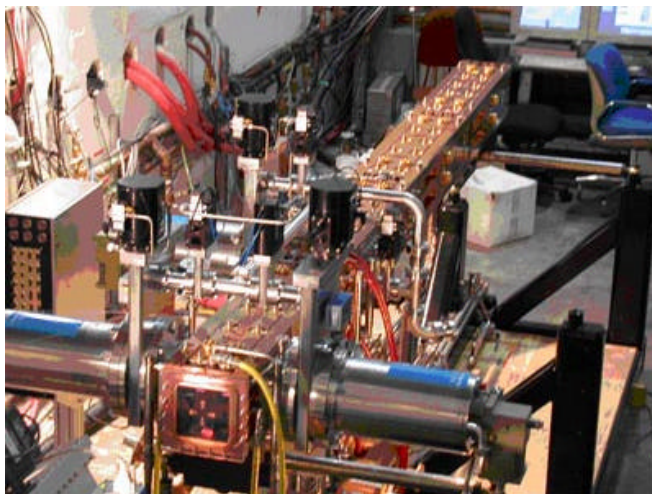
Design & Fabrication –Lowell Koht

Logistics

ALS provided a list of critical capabilities, which are well aligned with our plan to improve our design and fabrication capabilities. Overhauling our scheduling system is the first priority, in spite of the attraction of new high-performance machines. We will upgrade the network and computing structure in the shops while rebuilding our scheduling system during FY02.

Main Shop

July marked the end of fabrication of the SNS Radio Frequency Quadrupole (RFQ) by Building 77 technicians. More than 2,000 hours of machining, grinding, and inspection since March of 1999 went into producing the four sections of linear accelerator. The skilled crew of Building 77 turned four tons of copper into one ton of precision scientific instrumentation on time, accurately, and with great care.



As a consequence of the ALS shutdown, the shop has been extremely busy completing the scheduled components for the two new beam lines. Staff have also been able to accommodate many walk-in jobs associated with much-needed repairs and upgrades within the ALS.

Our WFO load has increased with the addition of work for SLAC (Babar) and Oak Ridge (SNS). It is our intent to continue efforts in this direction.

Metrology

Construction has progressed to the point where we were able to complete the re-calibration of the Fantamation machine without affecting the completion of the RFQ vanes. We have been informed that support for the vision machine (View Precis) will terminate at the end of the calendar year; the company offers only replacement (no upgrade). We are searching for potential upgrade vendors; to date only one, Microna, seems adequate. To insure continuous customer service, we have also initiated a search for back-up capacity with local outside vendors. A total upgrade plan for the measurement area is starting and will be complete by the end of the next quarter.

UHVCF

Boomerang parts were completed on time. A new ability to do silver plating in-situ was developed for the ALS magnets. We have received notice of compliance from EH&S and EBMUD for the waste treatment facility.

Sheet Metal & Welding

The vast majority of work in this area has been devoted to the ALS scheduled shutdown.

77 Retrofit and New Cleanroom



External Seismic Retrofit



External Seismic Retrofit

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Sheetmetal Shop



Internal Crossbracing



New Cleanroom



DesignWorks – New Home

New Procurement Procedure – Dana Barth

The Engineering Resource Group has initiated four Blanket Purchase Orders (BPOs), each with three to five suppliers: large machine shops; medium machine shops; small machine shops; and sheet metal shops.

In all, 15 vendors were chosen to be part of these contracts; a quality survey was completed for each vendor during the past three months.

These BPOs will enable John Mehren, Doug Morton, and John Moreau to place requirements up to \$25,000 without involving Ron Ball in Purchasing. It will also provide a “Fast Track” placement method for expediting purchases, which will permit jobs to start much more rapidly than is possible using current procedures. Fast Track Orders will require project management authorization to ensure that only schedule-critical items are handled in this manner.

Electronics Engineering –Richard Jared

Accomplishments

- Personal computers have been distributed, fulfilling the commitment to replace EE CAD computers every three years on average. It is very important that users have the equipment that will maximize efficiency and work-flow speed.
- PDM software has been installed for AutoCAD. The system is now undergoing initial testing. This software will improve documentation and project flow.
- Jonah Weber has been hired as an instrumentation engineer for ALS.
- The SNS EE techs were recognized with a team Outstanding Performance Award for their efforts in supporting development of the Ion Source/LEBT systems.

Issues

- Electronic CAD implementation needs to be completed during the next several months. Implementation of the PDM system for AutoCAD and establishment of the CAD user support system still need to be addressed. Good progress has been made on the PDM system for AutoCAD.

SNS Electronics

The high-voltage enclosure was fully upgraded to a deliverable system that will support operations at LBNL and SNS. Changes include installation of rack 02 in front of the matching network to allow for simpler cabling and connections to the ion source. All cable trays have been simplified and shortened, and the rack housing the high-voltage safety relays has been split into two parts servicing the 65 kV PS and the LEBT lenses. Each is providing safety grounding where voltages enter the enclosure. Most major components were rearranged, and their control interfaces were finalized and repackaged.

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The design was optimized for high-voltage breakdown. All upgrades were accomplished during a minimal shutdown.

During the high-voltage enclosure upgrade effort, many control interfaces were also upgraded. A new transceiver system was selected from the STAR detector electronics to be the basis of a finer optic isolation system that will distribute triggers and timing pulses (including the gate to the RF amplifiers). Likewise, two four-channel Tektronix scopes were installed to provide up to eight channels of diagnostics on EPICS through ethernet interfaces.

All modules of the RFQ were completed, characterized by the bead-pull field mapping method, and tuned for frequency and field flatness. They were then commissioned to full power and are currently being installed in their final supporting structure. The RF windows are being conditioned in a separate test stand.

Good progress has been made on the LLRF system for the MEBT rebuncher cavities. The digital part of the system has been fully debugged in hardware. We are in the process of establishing and optimizing communications with the Xilinx FPGA in order to download and test the control algorithms.

The analog system is also undergoing bench tests for the connectorized components, including the pulsed RF detector, RLC filters, phase shifter, I/Q modulator, power amp, and PIN switch. We have measured signal levels at the various stages for characterization and comparison to designed values. The analog board to support the components has been sent by the ALS CAD layout group to the vendor for fabrication. The integration of the digital and analog system with the RF cavity and tuners is expected to begin in October.

The first RF cavity was received from the vendor and commissioned to full power. Conditioning of the cavity proceeded very rapidly and was limited only by the available RF power. The setup permitted testing of the hybrid combiner to high power and high duty factor. During this testing, x-ray surveys monitored radiation levels, so we can assess for safe operation in presence of personnel. The levels measured were consistent with expected levels for field emissions and led to the current design efforts for shielding the cavities in the beam line.

ALS Electronics

Superbend commissioning required that interface chassis and cables be installed and checked out. This work was completed successfully, and performance indicators were measured. Superbend is working at design specifications. This is a major accomplishment.

A new 500-W Milmega amplifier was installed and successfully tested for fast feedback (transverse and longitudinal) systems.

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The main RF system for the ALS has been improved. The mechanical design of the storage ring cavity Higher Order Mode (HOM) dampers is near completion. A new “klystron fast phase control loop” was tested and commissioned for the main RF system. This loop keeps the klystron RF phase constant during changes in the klystron beam current. This change will improve transverse and longitudinal stability.

STAR Electromagnetic Calorimeter Electronics for RHIC at BNL –Bob Minor

The STAR EMC group has successfully installed readout electronics for a patch of 12 EMC modules (10 percent of the detector). The majority of the readout electronics were developed and built at LBNL.

This patch contains 480 towers and 3,600 channels of shower maximum detector. Debugging of the patch readout continues; this process has been complicated by lack of ready access to the electronics. However, the EMC towers have been read out through DAQ for pedestals, LED pulsers, and physics data. Overall system noise is at the level of or better than that seen on the bench. The towers are ready for first inclusion in the running of STAR.

Readout Driver for ATLAS at LHC –John Joseph

The prototype ROD Electronics Board has passed the initial System Integration Test at Cambridge. VHDL code for all five of the FPGA blocks is now in the maintenance mode (there are 12 FPGAs in all, but eight share the same source code). We are currently preparing the production model for fabrication. The design effort for the board represents more than five man years.

Boron Neutron Capture Therapy Neutron Source –Lou Reginato

We have received Phase II STTR for Boron Neutron Capture Therapy (BNCT) with Science Research Lab of Boston. Engineering will be awarded \$167K to participate in the development of a novel, compact, accelerator-based neutron source for BNCT.

DARHT Electronics –Will Waldron

The DARHT Pulsed Power group has assembled, tested, and shipped 13 of 24 Standard Reset chassis to LANL. The prototype Long Reset chassis has been built and will be tested by the middle of October. The Standard Reset chassis is scheduled to be complete by the end of October, and the Long Reset (24 chassis) is scheduled to be complete by the end of November. These chassis are the last of the hardware to come from the LBNL DARHT pulsed power group. The only remaining responsibilities will be documentation and commissioning support at LANL.

Mechanical Engineering –Joseph Rasson

As has been announced, I will be stepping down from my position as Mechanical Engineering Department Head to support LHC project management activities. I would like to thank the ME staff and the Engineering Division management team who supported me and made my term as department head productive and enjoyable.

I am proud of our accomplishments of the past 2 years. The department's functions today are consolidated and stronger. We have built up our infrastructure by updating design, analysis, and product data-management tools. We are implementing several e-business initiatives that will allow us to do concurrent engineering design, e-job order placement, and e-document management and tracking. The department is also updating design data and ME Safety Guidelines handbooks and placing them on the web to make them more accessible and easier to update and link to other useful URLs. The ME Dept. has established closer links to the Design and Fabrication Department to ensure smooth integration of mechanical design and technology functions. Steve Virostek is leading a committee that is making recommendations for upgrades to the Building 77 shop infrastructure. I encourage you to give him your constructive input.

The ME Department has also established clear guidelines for performance measuring, ranking, and salary management. Along with these new guidelines, we have asked supervisors to emphasize employees' career development and training. The department has been very successful in promoting and equitably rewarding the ME staff.

There is still a lot more to be accomplished, and I am sure that my successor, Victor Karpenko, will continue to pursue the goals that we established, while adding new, fresh ideas. In my opinion, the key challenge will be to better align the mechanical engineering skill set to the laboratory's future needs while maintaining and enhancing our present core competency.

I wish Victor the best of luck with his new assignment and ask all of you to give him your full support.

Software Engineering –RP Singh

ALS Controls

The Controls Group (and everyone else) at the ALS has been quite busy the during the past few months preparing for the installation and commissioning of the superconducting bend magnets (superbends). These five-Tesla magnets, which operate at temperatures lower than 5 degrees Kelvin, will improve ALS capabilities in significant ways. The project has posed both technical and scheduling challenges on many fronts. In particular, new precision and stability have been demanded of the control system, and the control of all corrector magnet power supplies and many beam position monitors has been moved to new, higher-performance hardware in preparation for a 1-kHz update global-feedback

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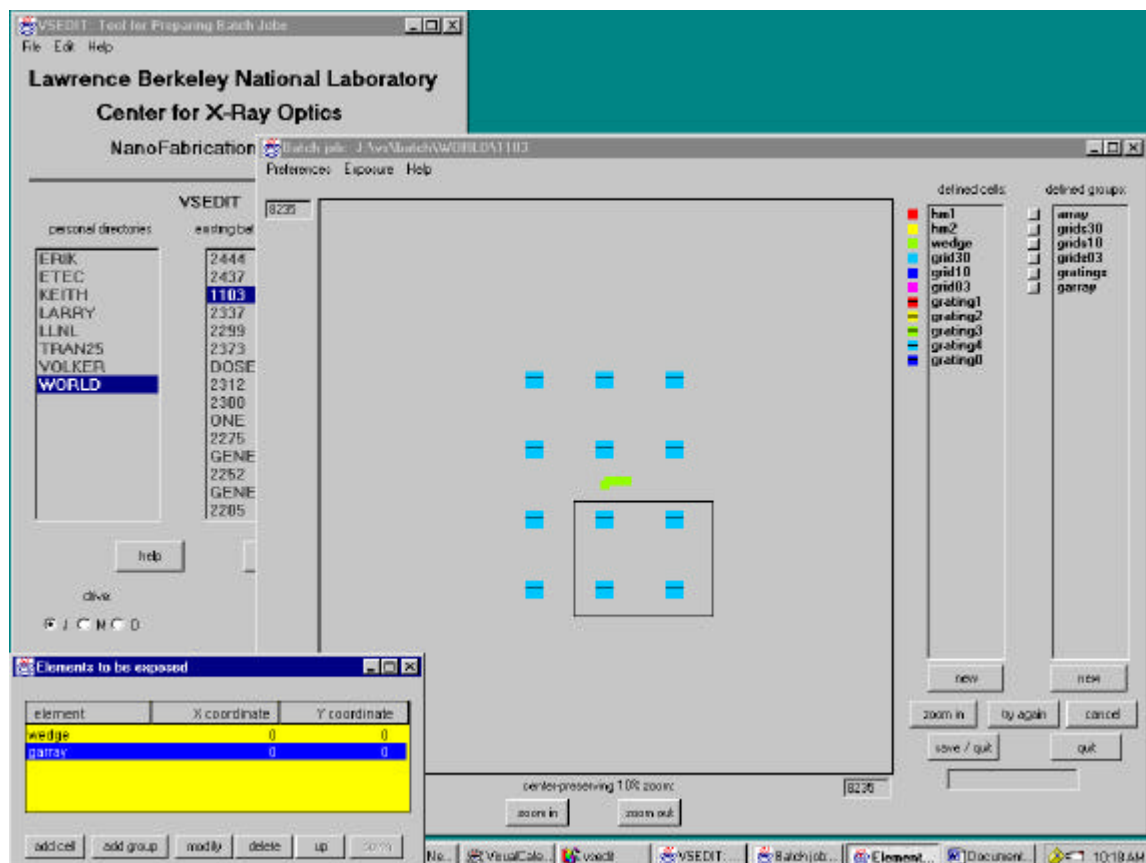
system. The network systems were also significantly upgraded for multi-Gigabit capability. This required substantial efforts in planning, procurement, fabrication, testing, installation, configuration, and software.

Joint Genome Institute at Walnut Creek

Yunian reports that he recently provided the PGF with the ability to process and track data from the ABI3700 sequencing machines in a manner similar to what is already being done for our MegaBace machines. He also created the appropriate web pages to display results from these machines.

CXRO Nanowriter Group

Eugene Veklerov has developed a new wafer pattern layout tool for the Nanowriter Electron Beam Lithography system. The name of the tool is VSEDIT; it is written in Java. This highly interactive suite of programs replaces a legacy DOS program that only ran under the OS/2 operating system. The new tool has superior features, such as exposure-time estimates and dose variations in arrays, which will be very helpful to users. The new VSEDIT is portable and runs on desktops in the offices as well as in the lab. A future upgrade path to a web-based layout program is possible with this approach. The current user interface screen for VSEDIT is shown below.



Systems Engineering –Bill Edwards

Accomplishments

Sample systems engineering documents for a small DesignWorks project have been completed. Another Systems Engineering Discussion Group meeting is scheduled for Oct. 5 to discuss the results of the “case study” that Ed Kujawski and Ken Chow have been working on. Once we have reviewed the documents and are comfortable that they provide appropriate examples to help users understand System Engineering’s Functions/Roles and related products, we will circulate a draft Systems Engineering handbook. Anyone is welcome to contact Bill Edwards about joining these discussion group meetings. The goal is to develop a simple set of tools to help organize and manage efforts efficiently for both large and small projects.

Other accomplishments this quarter include:

- SNAP orbit trades with the Space Sciences Lab (SSL) were completed (L. Gullo).
- Two papers were completed. “Why Projects Often Fail Even With High Cost Contingencies” and “Selection of Risk Responses for Efficient Contingencies” describe probability-based contingency analysis, contingency management, and development of a cost-effective set of responses to project risk. “Why Projects Often Fail Even With High Cost Contingencies” has been accepted for publication in the journal *Systems Engineering* (E. Kujawski).
- The lab-view motion control project for the Earth Sciences Division was completed. Currently, additional functions are being added (F. Rene).

Planned Actions

- We will review simple and relevant Systems Engineering function examples (documents, etc.) from the DesignWorks project – complete Oct ’01.
- We will produce a first edition of the LBNL SE Handbook – complete Nov ’01.
- We will begin Systems Engineering work on the Femto-second Source proposal.

Advanced Light Source –Alan Paterson

Superbend Project

See the feature story by Steve Marks in the News Section. Pictures are posted at:
http://www-library.lbl.gov/teid/tmPhoto/clients/25645_harkins/index.html

Issues

- After installation, the magnets ran at slightly higher operating temperatures than during the performance testing. Removal of a “stinger,” which is part of the

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helium delivery system used for the filling of the helium reservoirs, reduced these temperatures. This issue will be addressed in a redesign of this element of the system.

- All documentation of the performance and operation of the superbends is complete.

Superbend Beam Lines

Accomplishments

- Prior to the superbend shutdown, two of the beam lines were commissioned with the bend magnet source. Beam line 8.3.1 (UCB/UCSF) was used to compare two of the commercially available protein crystallography detectors. Beam line 8.2.1 was used for commissioning and analysis of the beam-line optics. The “mini-hutch” end stations have been in use, and the sample manipulation and detector positioning systems have been successfully commissioned. During the shutdown, the beam lines were moved to their superbend locations and will be ready for the superbend beam at the end of the commissioning period.

Issues

- X-ray optics issues that affect beam-line performance are still being examined. One concern involves polishing imperfections and possible stability issues of electroless nickel plating on Invar Substrates of the M1 mirrors. The second issue is residual strain in the Silicon monochromator crystals, which have been sent back to the vendor for additional etching and strain relief. Both of these issues affect beam-line focus and total flux relative to perfect optics; however, neither keeps the beam lines from being functional for protein crystallography. The possibility of using side-cooled silicon mirrors instead of the current M1 mirrors is being explored.

Molecular Environmental Science (MES) Beam Line

Accomplishments

- The Molecular Environmental Science project at the ALS is entering its third and final year. Beam-line commissioning is scheduled to start at the beginning of June 2002, and the final optical subsystems and wet spectroscopy end station are due to be installed and in service by the end of September 2002. Three-dimensional models of all major optical systems except the KB refocusing mirror pair have been completed and their respective optics are currently being worked on by various polishing subcontractors. An extensive cost-to-complete exercise was done in July; the \$6M project is on schedule and expected to be within budget.

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Issues

- Design and development work must be conducted in the context of a protracted funding profile.
- Precision mechanical performance of the monochromator mechanisms will be addressed by a series of performance tests.
- Bonding of pressurized water-cooling passages in the silicon mirror is a concern.
- Assembly space for the EPU device is also a concern.

Beam Line 5.0 Carbon Filter

Accomplishments

- A newly designed and built carbon filter assembly was installed in the beam line 5.0 front end during the ALS superbend shutdown. The new filter assembly has an integral vertical mask to reduce total power load on the carbon filters, a smaller filter area coupled with better conductance and pumping to improve vacuum performance, and an integral diagnostic feature for monitoring the integrity of the individual filters.

Issues

- The carbon filters may outgas as they receive the first beam, which could affect initial operations.

Spallation Neutron Source –Ron Yourd

A number of improvements were made to the Ion Source and Low-Energy Beam Transport (LEBT) high-voltage systems, and many elements in the “Big Blue Box” have been renovated and improved. The source has also been upgraded with improved RF antenna insulation; improved lifetime and reliability are expected to result. Source and LEBT testing is scheduled to resume in late September.

The fourth and final RFQ Module was completed, and RF power conditioning to full gradient and duty factor has been completed. Also, the first two modules have been joined together and mounted in the support structure, and all vacuum, RF, and water systems have been installed and qualified. So far, each module has met all of its very stringent mechanical and electrical requirements; the next step is to assemble all four units onto the support structure and begin testing the components together as a full RFQ system. The fully assembled RFQ can then be installed and connected to the LEBT exit within the next several months.

The Medium Energy Beam Transport (MEBT) section is also making excellent progress. Most systems and subcomponents have been received and tested, and work is now beginning for final assembly and alignment of all components onto the MEBT support

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structure. This phase began in August, and most of the components required for the first raft (the first of three) have already been installed and aligned. Electronic systems are also progressing well, and instrumentation and beam diagnostic components are being characterized.

Excellent progress continues on the control system, and both RFQ and MEFT subsystem controls are being added and checked out incrementally as they become available. A busy schedule of FES integrated beam testing is planned for the next several months, and disassembly and shipment to ORNL are planned for June 2002.

Administrative Services –Karen Paris

Completion of annual P2Rs and end-of-fiscal-year business made the past three months extremely busy. Administrative staff managed and completed these tasks ahead of deadlines.

Environmental Safety & Health –Weyland Wong

For those who did not see and understand Jim Triplett's "Stop the Bleeding" level 1 message, please check it out at <http://engineering.lbl.gov/news/newsredirect.htm>. Eleven accidents and injuries occurred between July 1 and August 30, a period of nine weeks; that was an average of 1.2 injuries per week.

The Engineering Division Managing Environmental Safety and Health (MESH) Review acknowledged some noteworthy practices in the division and also found plenty of room for improvement. The MESH Report on the Engineering Division can be found on the ES&H page under "documents" at the Engineering Division web site.

Division employees must complete required health and safety training. If an employee's name appears on the Division web page safety training report (sorted by department head) with an indication that required safety training is incomplete, the employee needs to update health and safety training. Responses to the Job Hazards Questionnaire (JHQ) dictate the safety training that each division member is required to complete in a timely manner. Some types of training expire and require recertification/retraining. Employees who have not filled out their JHQs during the past four months need to do so because the JHQ has been revised.

Self-Assessment Program

- Self-Assessment Inspections for FY2002 have begun. The first inspection completed was in building 80. Please see the Engineering Division web page for the FY02 schedule of buildings to be inspected.

Sponsored Research Administration –Lisa Rebrovich

Accomplishments

- As of September 12, 2001, 61 projects, including 27 new ones, have been funded. Out of the \$8.4M in funding received, the division plans to spend \$5.7M this fiscal year. Currently, we have spent 90 percent of planned funding and are on target to complete expenditures as projected. The spending plan was reduced from \$6M in August. Funding has increased by \$2.4M in comparison to FY00.
- Fifty-eight proposals were prepared this fiscal year, and five more proposals are in the works. Twenty-six proposals are pending. Many of the pending proposals are renewals for the next fiscal year of currently funded projects.
- August and September have been extremely busy with proposal writing, year-end spend plans, and requesting and processing no-cost extensions on 15 projects, as well as bringing in new funding.
- Norm Madden received an award from NASA for the Mercury Messenger Mission project. Only 12 days elapsed from the time the proposal was prepared and submitted, until it was approved by DOE and initial funding was received. This remarkable turnaround was thanks to Nancy Saxer, Contract Officer, who was able to get DOE in Oakland to expedite approval of the proposal and the funding order. This is a 14-month project with \$557,789 in funding. We will prepare a subcontract to U.C. Space Sciences Laboratory for \$183,000. Several organizations will collaborate on this NASA project (John Hopkins University, LLNL, LBNL, and Space Sciences). Congratulations to Norm on his award.
- Jim Triplett and Deb Hopkins received an award from DOE for Dense-Wavelength-Division-Multiplexed (DWDM) Optical Network Design and Analysis Tools. DOE will fund about \$340K, and Fiber Network Engineering will fund \$60K. The call for proposal came from the LBNL Technology Transfer Department.
- Lisa prepared a training package for all financial and administrative staff. The training covers proposal processing and project tracking in Engineering's Sponsored Research Administration office.

Planned Actions

- As soon as the new rates come out for FY02, spending plans will be prepared for each project that will continue into the next fiscal year. The goal is to get spreadsheets completed by the end of October so that the November management report can be prepared. Lisa will work closely with all PIs to prepare this information.
- Many new reports and updates to spreadsheets will need to be generated for the new fiscal year. As soon as FY01 ends, Lisa plans to update the database and the PI monthly cost report, so it will be ready for the new fiscal year.

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Finance –Bob Liu

Accomplishments

- The third Engineering Division quarterly financial review was conducted. Each department head presented quarterly financial results, compared them against the budget, explained deviations from the budget, and commented on results expected during the remainder of the year.
- As a result of the quarterly financial review, planning for year-end closing began.
- FY02 budgets were formulated and submitted. The indirect budget approved by Lab Operations includes an additional \$200K for equipment leasing. This approved budget item will set the stage for the Engineering Shop modernization project.
- The “One-Stop Shopping Services” model, instituted in the second quarter of FY-2001 to provide better human resources, administrative, and financial support services, has been working well. In addition to improving efficiency, it appears to have boosted the morale of support staff members.
- Please refer to the Sponsored Research section for significant events in that area.

Issues

- The third quarterly review revealed relatively poor planning in indirect budget execution.
- The current cumbersome Engineering accounting structure (the project tree) continues to be a source of booking errors.

Actions

- A financial tracking report using a simplified accounting-tree structure is being developed.

Human Resources –Leslie Cobb

Congratulations to Pamala Williams-Perkins, who completed a certificate program in Human Resource Management through Cal State Hayward.

The Engineering Human Resources (HR) Office has revised its workload distribution. In the past, all HR work for the technical departments was handled by one HR Generalist, and all HR work for the non-technical departments was handled by the other HR Generalist; the HR Assistant primarily performed processing tasks. To provide better service and create development opportunities for HR staff, work will now be distributed by function across all departments in the division:

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- Pam's functions: service awards, contract labor and guests, leaves of absence, access to personnel files, and maintenance of the HR portion of the Engineering web site.
- Rita's functions: recruitment and hiring, limited appointments/rehired retirees, appointment extensions, visa and permanent residency issues, and some salary management.
- Michelle's functions: OPAs and Spot Awards, reclassifications, probation tracking, skills surveys, out-of-class and dual-class assignments, succession planning, and HR reporting.
- Leslie's functions: performance management, union issues, investigations, new policy interpretation, new job family implementation, and salary management.

Division members can continue to go to any HR staff member for information because regular updates will mean that all staff will be familiar with the status of any ongoing HR issue or assignment within the division. However, employees are strongly encouraged to take concerns directly, whenever possible, to the person with primary responsibility for the issue in question. The HR organizational chart will be updated shortly to reflect the new distribution of work.

By now, all represented technical employees should have received FY01 retroactive checks. The OPA and Spot Award programs were included. The FY02 salary management process for all Engineering employees is in progress.

Critical issues

- A significant percentage of the Engineering Division will be eligible to retire within the next five years. We are concerned with developing and maintaining depth within our core competencies as employees retire.

Actions

- Michelle will be meeting with Department Heads to talk about their anticipated future needs and the skills required to meet coming challenges in order to develop a division-wide succession plan.

Property & Space –Barbara Davis

Between October 1 and November 30, the division will be starting Wall-to-Wall Property Inventory with the assistance of temporary employees. Please allow these employees to inventory all equipment in your offices, shops, and labs. Electronic notices will be sent from the Property Management System once items are inventoried. Employees who have equipment at home should fill out the "Home Pass" form located on the Engineering Division web page under "Property & Space," and send it by email badavis@lbl.gov or

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by regular mail to Barbara Davis at 46A-1123. A copy of the Home Pass must be on file for each employee who has equipment at home.

The last Wall-to-Wall Property Inventory was in 1998; at that time, the division inventoried 99 percent of its equipment. Four items were never found, and the division was charged for those items against the 1999 budget. Please help find all of division property for FY02 so that the inventory can be 100 percent complete.

Accomplishments

- Design Works is now located in building 77-244 (Old Glass Shop). Ken Chow, Robin Lafever, Steve Dellinges, Tim Loew, and Lisa Gullo have all moved to this new location.